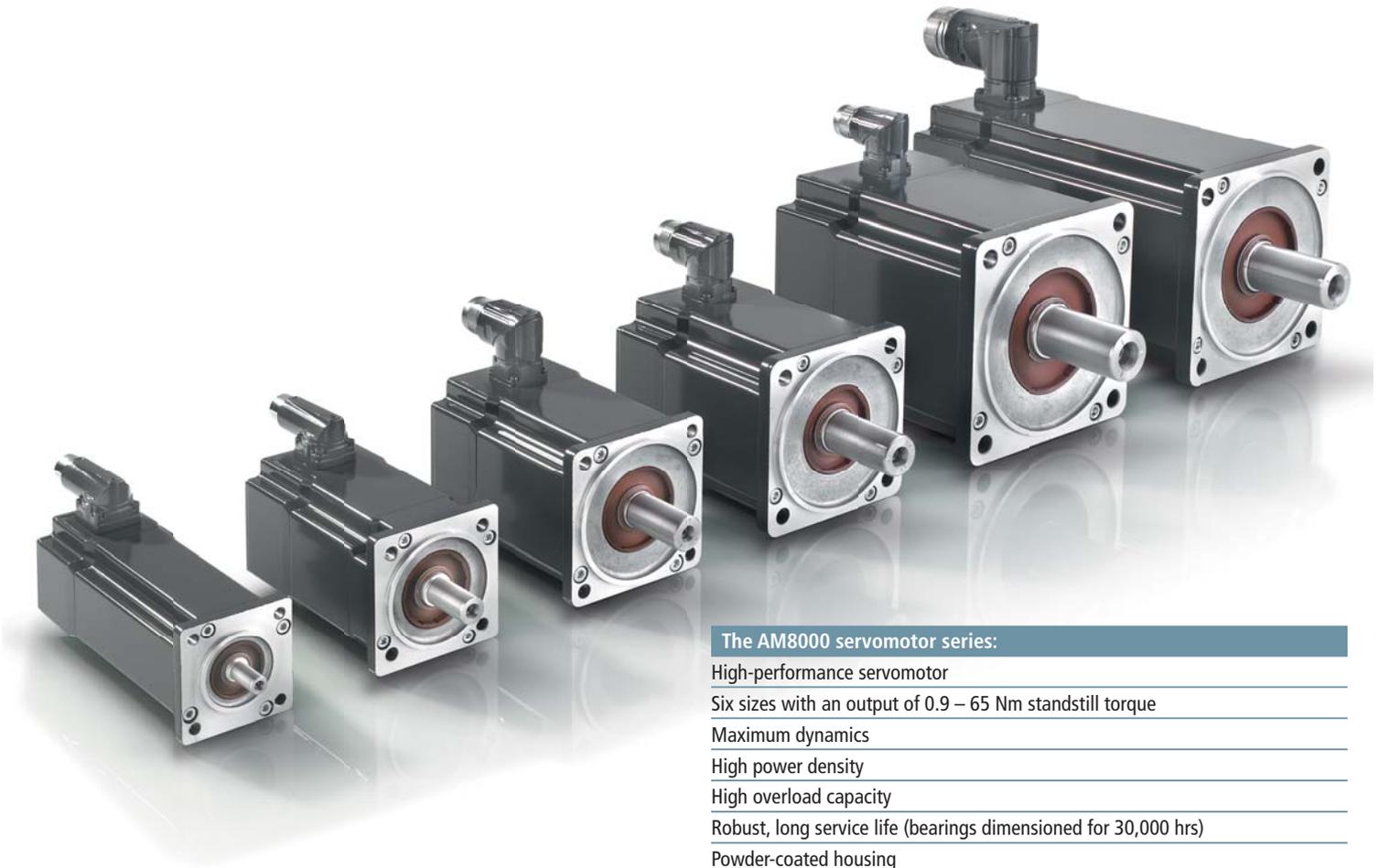


Beckhoff AM8000 servomotor series:  
single-cable solution reduces material and commissioning costs

## The latest generation of highly dynamic servomotors



The strategic development of the Motion division at Beckhoff is progressing rapidly. Following a development period of just 1½ years, Beckhoff will present the new AM8000 motor series. The rotary synchronous servomotors, which are available in standard and in stainless steel designs, are characterized by high dynamics, energy efficiency and low costs. In order to ensure the highest quality standards and high availability on a sustained basis, all motors are made in Germany. The highlights of the new series include single-tooth technology, high rated torque, long service life and the new single-cable technology, with which the power and feedback system are combined in one standard cable. Material and commissioning costs are significantly lowered as a result.



**The AM8000 servomotor series:**

- High-performance servomotor
- Six sizes with an output of 0.9 – 65 Nm standstill torque
- Maximum dynamics
- High power density
- High overload capacity
- Robust, long service life (bearings dimensioned for 30,000 hrs)
- Powder-coated housing
- Single-cable solution for power and feedback system
- Connecting plugs swivel by up to 300°
- Energy-saving, backlash-free, permanent-magnet holding brake

With the new AM8000 high-performance servomotor series, Beckhoff now offers a complete automation system consisting of a PC-based controller, I/O, drives and motors from its own development and production. In combination with the Servo Drives from the AX series, to which the AM8000 series is matched with regard to power rating and windings, Beckhoff can now fulfill its customers' requests even more flexibly. Apart from high availability and flexibility, development and production in Germany ensures consistently high-quality. The complete new servomotor series will be available from the 1<sup>st</sup> quarter of 2012.

**Consistently modular: motor series for universal use can be tailored to specific customer needs**

The AM8000 series encompasses six different motor sizes, each with two or three overall lengths, so that the widest possible torque range is covered seamlessly with overlaps. The user can select a motor suitable

Single- and multi-turn encoder

Single-cable solution for power and feedback

- modular design
- greatest possible variability

Backlash-free permanent-magnet holding brake

- single-tooth coil technology
- fully-encapsulated stator

Powder-coated

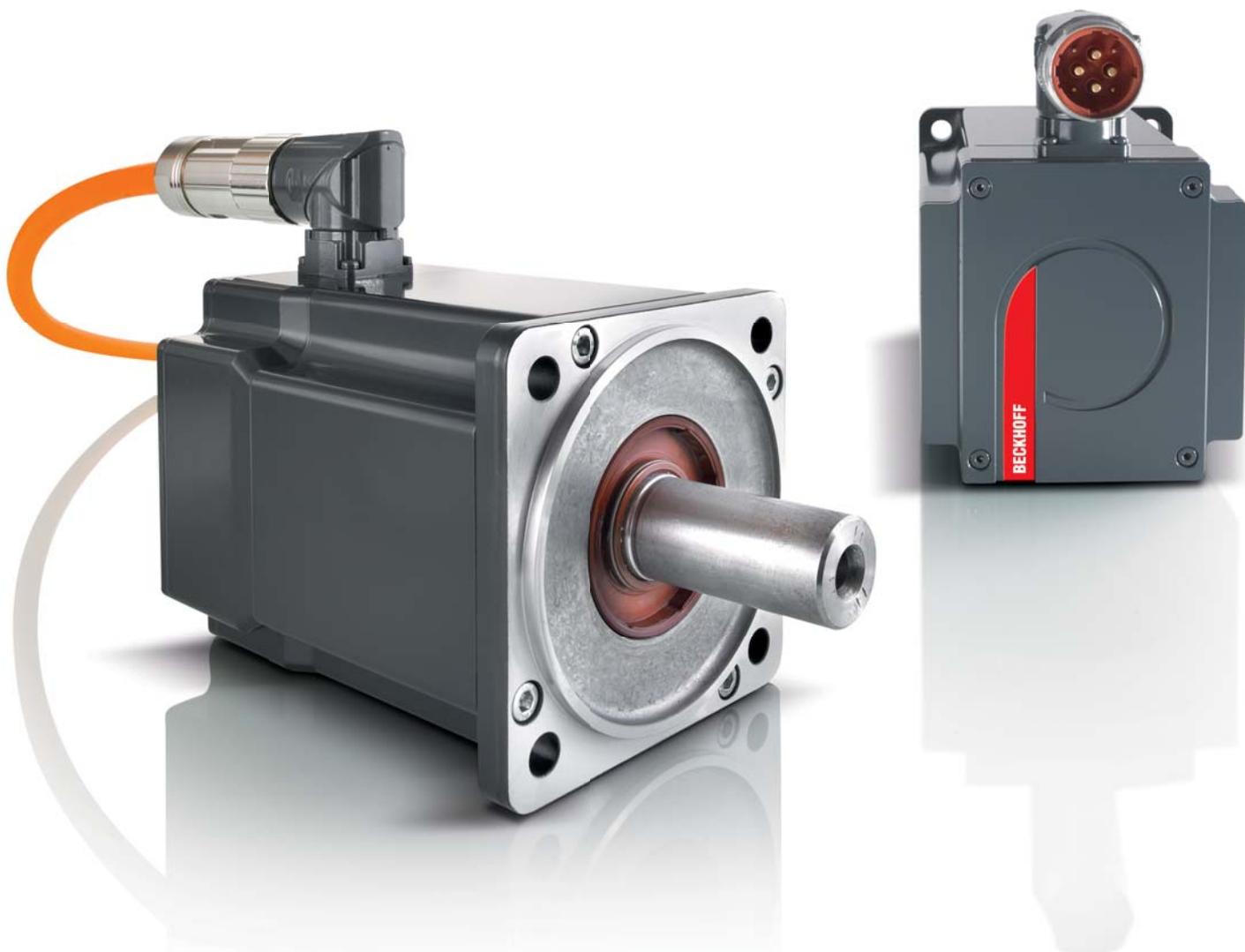
- scratchproof
- durable

High-quality radial bearing

- service life 30,000 hrs
- maximum axial and radial loadability

- low cogging
- high-performance

- high power density
- high overload capacity



for their application from a standstill torque range of 0.9 to 65 Nm. The dynamic AM8000 motors are designed for universal use over the full spectrum of machine construction: Whether in woodworking machines, handling or packaging machines, the motors from the new series can be used in almost all applications. Particular importance was attached to a modular structure during the development of the AM8000 motors. This way Beckhoff can implement mechanical adjustments simply and react to customer requirements. The smooth housing shape of the servomotors prevents the excessive accumulation of dirt and makes cleaning simpler. The housing is completely powder-coated so cut edges are concealed, providing very high resistance to scratches and corrosion. The housing shape is implemented in a cross profile design ensuring simple assembly.

#### **Single tooth winding technology enables higher slot fill factor**

The sophisticated rotor and stator technologies represent the actual basis for the new servomotor. Among other things, the motor makes use of modern single-tooth winding technology. The technology has been consistently developed further, enabling an even higher slot fill factor.

Small end turns in conjunction with a fully encapsulated stator provide robustness and excellent thermal management. In addition, the developers have succeeded in reducing the sources of loss in the motors through optimized design and the use of high-quality materials. This enables high utilization of continuous torque over the entire speed range, offering a decisive advantage for practical applications. Beyond that the motors can be overloaded up to five times the standstill torque, which is extraordinarily high for pole-wound motors. Here, the user has the advantage of being able to select a smaller overall length or size for applications in which the peak torque is important. It was also possible to increase energy efficiency by more than 10 % compared to conventional servomotors, since power losses have been significantly reduced.

#### **Robust design and long service life**

A further important development target was the greatest possible running smoothness of the motors in operation. Apart from the design of the active parts, the entire mechanical construction as well as new materials and manufacturing methods contribute to this. The magnetic imbalance was reduced by the optimization of the magnetic design and the running smoothness is noticeable.



One of the highlights of the new Beckhoff servomotors is the single-cable technology, which saves the user from having to use an expensive, inflexible hybrid cable.

Even in the basic version, the AM8000 motors are equipped with IP 65 housings and are therefore usable under harsh environmental conditions. On request, the shaft bushing can be equipped with an FPM (fluoroelastomer) shaft seal, so that the entire motor has IP 65 protection. One of Beckhoff's most important development targets was to offer the user an exceptionally robust and durable product, since motors are sometimes installed in cramped spaces where they are difficult to access and can only be removed with great effort. With generous dimensioning of the sealed ball bearings, a service life of 30,000 hours is guaranteed. Another positive aspect here is the high permissible radial loads that can act on the bearings, as a result, a support bearing can be omitted, among other things.

Backlash-free permanent-magnet holding brakes are also offered on request. The Beckhoff range also includes the low-backlash planetary gears from the AG series, which are ideally suited for use with the AM-motor series.

## Single-cable solution for power and feedback system reduces component and commissioning costs

The new single-cable technology, with which the AM8000 motors are equipped, saves the user from having to use the normally required feedback cable or an expensive hybrid cable in addition to the obligatory motor cable. As opposed to sensorless control, highly precise positioning and low speeds can be achieved using the single-cable technology. The encoder data, rotor position, multi-turn information and the status of the thermal conditions in the motor are transmitted reliably and free from interference via a purely digital interface. This results in significant cost savings, since plug connectors and cables are eliminated at both the motor and the controller ends. Costly analog evaluation function blocks in the drive amplifier are no longer necessary. There is also a diagnostic option. The wiring is considerably simplified, eliminating possible sources of error. This also has positive effects on the peripheral devices, since drag chains, cable bushings and areas reserved for cables in machines and control cabinets can now be made smaller. There are no limitations whatsoever to the maximum possible cable length: up to 100 m can also be achieved with the single-cable solution. Naturally, the new technology also supports an "electronic type plate."

This results in greater degrees of freedom on the motor side: the omission of a plug connector permits use of the new technology even in the smallest motor sizes. The motors from the AM8000 series are driven by the AX5000 EtherCAT Servo Drives; future developments will also support this feedback technology.

### Summary of the single-cable solution:

- | Digital single-cable transmission via the existing motor cable
- | Digital transmission of sensor data
- | No interference-susceptible analog signals
- | Support for the electronic type plate
- | Encoder cables, including expensive plug connectors, are eliminated
- | Reduction
  - in costs for the cable, plug connector and assembly
  - in warehouse costs by eliminating a cable variant
  - in space requirements from cable carrier chains
  - in space requirements on the motor (important with small sizes)
  - in the sources of error and wear
- | Remote diagnostics are possible up to the motor
- | Cable lengths of up to 100 m are possible



The stainless steel motors from the AM8800 series are ideal for use in the food, chemical and pharmaceutical industries. The motors with "Hygienic Design" have been developed in accordance with FDA requirements.

## New AM8800 stainless steel servomotor series with "Hygienic Design"

As a new solution, Beckhoff offers the AM8800 motor series in a proprietary-developed stainless steel version. The stainless steel motors are implemented completely in a "hygienic design;" they can be used in extremely harsh or corrosive environments and are particularly suitable for use in the food, chemical or pharmaceutical industries. The AM8800 series is based on the Beckhoff AM8000 motor series. However, it has been supplemented with an all-stainless-steel housing in AISI 316L and a stainless steel motor shaft, which were designed according to FDA guidelines. The series encompasses three sizes, each with three overall lengths. The power range extends from 1 – 8 Nm standstill torque. In selecting the motor design, corners and edges were avoided and drill holes and screwed connections were largely dispensed with in order to prevent the accumulation of dirt. The flanges were implemented in B5 form and are compatible to the AM8000-series flanges. This also simplifies the conversion of existing plants to the new stainless steel version.

Power losses have been kept low by the optimum connection of the stators to the stainless steel housing. This is remarkable since the motors are used without additional cooling and the thermal conductivity of stainless steel is approx. 14 times lower than the standard aluminum housing of the motor. All AM8000 servomotors are equipped with a sensor for temperature monitoring, which passes the data on via the power/feedback cable. The data can be processed in the higher-level controller in such a way that the motor can be controlled in relation to its temperature. This function is required when processing easily perishable food such as fish, for example.

### The AM8800 stainless steel version:

Stainless steel motors in AISI 316L
Ideal for use in the food, chemical and pharmaceutical industries
Maximum protection IP 67, optionally IP 69K
Hygienic design
Design developed according to FDA requirements
Maximum dynamics
Optional barrier pressure system
Single-cable solution for power and feedback system
Food Grade Grease (lubricant for shaft seal)

The stainless steel housing is extremely robust and resistant to scratches and mechanical damage. Flaking of the coating or corrosion creep of the paint finish is thus consigned to the past and cannot lead to contamination. Equipped with IP 67 protection, optionally also IP 69K, the AM8800 motors are even suitable for cleaning with high-pressure cleaners, which are commonly used in the food, chemical and pharmaceutical industries. The permanent sealing integrity of the motors is ensured by connection techniques using stainless steel "hygienic design" cable glands. As a special feature, the AM8800 motors can be provided with a sealing air connection in order to prevent the formation of condensation inside the motor. They can also be equipped with a holding brake or a multi-turn encoder, depending on requirements.

The stainless steel motor series consists of three sizes, covering most market requirements. In conjunction with the CP77xx stainless steel Panel PC or the CP79xx stainless steel Control Panel, Beckhoff offers a universal control and Motion Control solution for the food, chemical and pharmaceutical industries.